

Introduction

Thank you for choosing our products. You will receive our comprehensive technical support and services.

Before using this instrument, please read the operation manual in detail. In order to enable you to operate the instrument as soon as possible, we randomly provide the detailed operation manual, which will help you better use this product. You can learn about product descriptions, usage, instrument performance, and safety considerations.

In writing this manual, we are very careful and rigorous, and believe that the information provided in the manual is correct and reliable, but there will inevitably be errors and omissions, please kindly bear with us and sincerely welcome your correction.

Our aim is to constantly improve and perfect the company's products, and we reserve the right to improve and upgrade the function of the instrument. If you find that the function of the instrument is not completely consistent with the description in the process of use, please refer to the actual function of the instrument. What problems can be found in the process of using the product? Please contact us in time! We will try our best to provide complete technical support!

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I. Purpose of instruments

This instrument is a special instrument for measuring the characteristic parameters of grounding device. The instrument adopts new frequency conversion ac power supply and frequency anti-interference technology, and adopts 32-bit ARM processor control and signal processing, which can be accurately measured in the substation's strong interference environment. The results are displayed on a large LCD screen, with a micro printer and usb flash disk storage. It mainly has the following functions:

1. Measure the grounding resistance or resistance of the grounding device.
2. Measure the conductive impedance or resistance between grounding devices.
3. Measure soil resistivity.

II. Main technical indicators

1. the grounding impedance measurement range: $0 \sim 5000 \Omega$, resolution: $0.001 \text{ m} \Omega$
2. the measurement accuracy: \pm (reading by 1% plus or minus 0.01Ω)
3. Connection method: standard quadrupole method
4. Automatic measurement
5. test frequency: single frequency 40 Hz, 45 Hz, 47.5 Hz, 50 Hz, 52.5 Hz, 55 Hz, 60 Hz and 65 Hz
Dual-frequency 45/55 Hz, 55/65 Hz, 45/55 Hz, 40/60 Hz
Accuracy: $\pm 0.01 \text{ Hz}$
6. Current output :1.0 ~ 5.0a, 1A step
7. Maximum output voltage: 400V
8. Main protection: ground protection, mis-connected 380V protection, audible and visual alarm, etc
9. Requirements for the measurement line: the copper core area of the current line is not less than

1.5mm², and the copper core area of the voltage line is not more than 1.0mm²

10. Working power :180V ~ 270VAC/10A, 50Hz + / - 1%

11. Data storage: 100 sets of measurement data are stored

12. Communication interface: standard rs-232 interface /USB interface

13, working environment: - 10 ~ 50 °C temperature humidity < 90%

14. Instrument weight :21kg(excluding cables)

15. Size: main engine length is 290mm * width 230 * height and 335mmmm

III.Instrument performance characteristics

1. Meet the specifications

The instrument is in accordance with JJG 984-2004 test procedure for conducting resistance of grounding and DL/T 475-2006 guide for measuring characteristic parameters of grounding device. It is suitable for testing ground systems under construction or in operation in power plants, substations, distribution stations and buildings.

2. Strong anti-interference ability

This instrument is measured by using the frequency method, which is combined with the modern software and hardware filtering technology, so that the instrument has high anti-interference performance and the test data is stable and reliable.

3. High data accuracy

Based on the industrial 32-bit ARM processing platform, all digital signal processing technology is adopted to measure data accurately, reliably and stably. The measurement error caused by wire is eliminated by using standard quadrupole method.

4. Simple operation

Large LCD display, full Chinese menu operation, automatic measurement, direct display of the measurement results. Internal large capacity memory, micro thermal printer, RS232 interface, USB interface, support U disk use, can store 100 test data, print test data.

5. Powerful functions

The data of impedance and resistance can be obtained at the same time, and the

comprehensive performance of the network can be accurately analyzed.

Measure ground resistance, conduction and soil resistivity.

Can separately detect the auxiliary grounding resistance to determine the status of the auxiliary grounding.

6. Safe and reliable

Earthing protection: instrument protection when there is danger voltage due to ungrounded enclosure.

Audible and visual alarm: an audible and visual alarm is issued after starting the instrument.

IV. Matters needing attention

1. The voltage and current output from C1/C2 terminal is enough to cause injury to human body! A person shall be responsible for monitoring and setting up danger signs, and ensure that test personnel and other personnel stay away from current leads and current piles before starting measurement.

2. Please use dual-frequency 45/55hz as far as possible for measurement. Other frequency measurements can be used for reference.

3. Pile on wet ground and water the current pile to reduce the resistance.

4. The current line should be kept away from the voltage line as far as possible to prevent measurement error caused by electromagnetic coupling between the lines.

5. Minimize the voltage pile resistance.

6. The instrument needs more than 12A power supply current, and sufficient power capacity must be ensured; otherwise, the output capacity of the instrument will be reduced. Do not use long, thin power cord.

7. Please contact the after-sale service department of the company directly if there is any other failure of the instrument. Please do not disassemble and inspect it without permission.

V .panel instructions



1. C1/C2 -- current output terminal: C1 connected current pile, C2 connected to grounding device. When measuring soil resistivity, there is no polarity requirement for C1 and C2.
2. P1/P2 -- voltage input terminal: P1 is connected to the voltage pile and P2 is connected to the grounding device. When measuring soil resistivity, P1 is close to C1
P2 is close to C2.
3. Grounding column: for safety reasons, the instrument shall be well grounded. If there is paint or rust at the receiving site, clean it.
4. Power outlet: AC220 ac power input (built-in spare 15A fuse side).
5. Power switch: the ac power supply is on and off. This switch should be turned off immediately in case of emergency.
6. Printer: print test data.

7. LCD screen: display menu, measurement results or error information. Avoid prolonged exposure to the sun and stress.
8. Communication: serial port /USB communication, with a baud rate of 9,600.
9. Contrast: a groove in the rotating hole can adjust the contrast of the display screen.
10. USB: support U disk storage.
11. Indicator light: alarm and error during testing.
12. Key: left key, right key, up key, down key, confirm key: adjust cursor position, modify value, confirm operation.

VI. Menu operation

1. Main menu

Turn on the power switch and display the main menu interface as shown in figure 1.

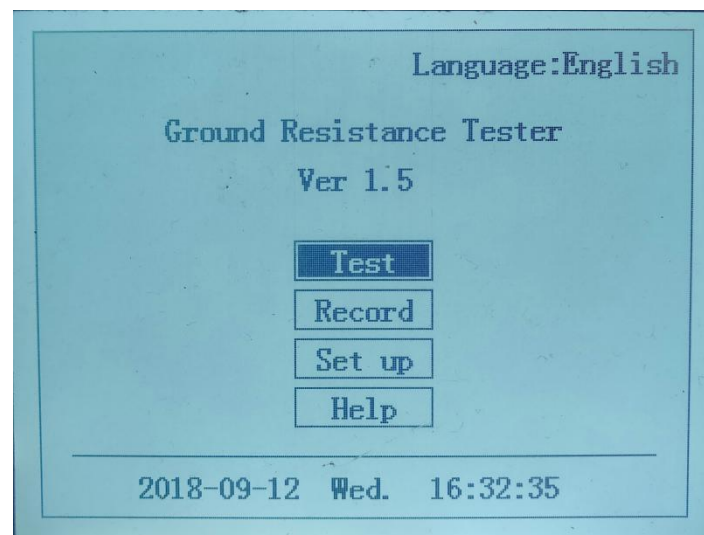


Figure 1 main menu interface

"Test " : select test items, test current, etc.

"Record" : view historical data.

"Set up" : set system time, etc.

"Help" : can see wiring diagram and so on.

2. "Test" menu

In the main menu interface, press the "test mode" button to enter the "test mode" menu when the cursor is in "test mode", as shown in figure 2.

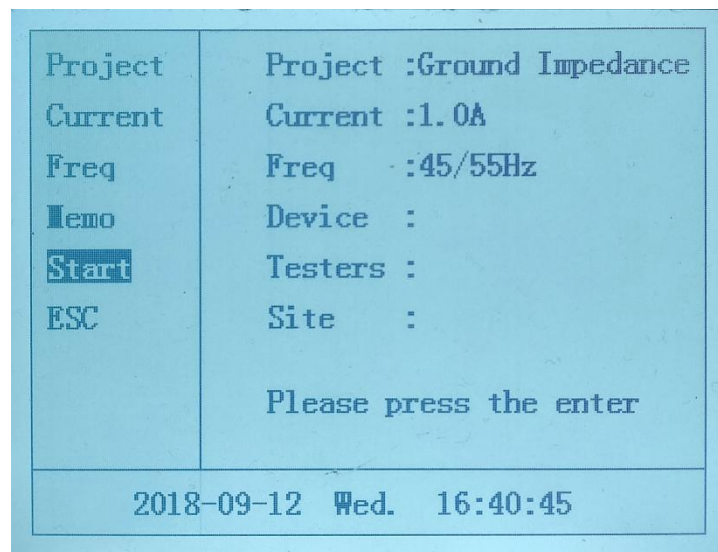


Figure 2 test mode menu interface

"project" : you can choose "grounding impedance", "power mode", "voltage pile", "current pile", "resistivity".

Grounding impedance: measurement of grounding resistance to the grounding resistance of a network.

Power mode: when measuring the step voltage, the instrument, as a power source, injects the test current into the earthing device.

Voltage pile: measure the grounding resistance of voltage pile to determine whether the pile is good.

Current pile: measure current pile ground resistance to determine whether the pile is good.

Resistivity: test the soil resistivity of the grounding grid. Set the length of the grounding pile to 20 m by default, with a maximum of 9,999 m.

"Current" : select 1.0A, 2.0A, 3.0A, 4.0A, 5.0A.

Test frequency: can choose double-frequency: 45/55 Hz, 55/65 Hz, 47.5/52.5 Hz, 40/60 Hz.

" Freq": 40 Hz, 45 Hz, 47.5 Hz, 50 Hz, 52.5 Hz, 55 Hz, 60 Hz and 65 Hz.

"Memo" : you can set "equipment number", "tester", "test site".

"Start" : if the "test item", "test current" and "test frequency" are all required, long press the "confirm" button (about 5 seconds) to start the test. If not, you can go to the corresponding menu

to make changes.

"ESC" : return to the previous menu.

After the test is started, the instrument first detects the power supply and waits for the voltage boost of the power supply to the preset value and detects the connection and ground network, and then enters the test interface as shown in fig.3.

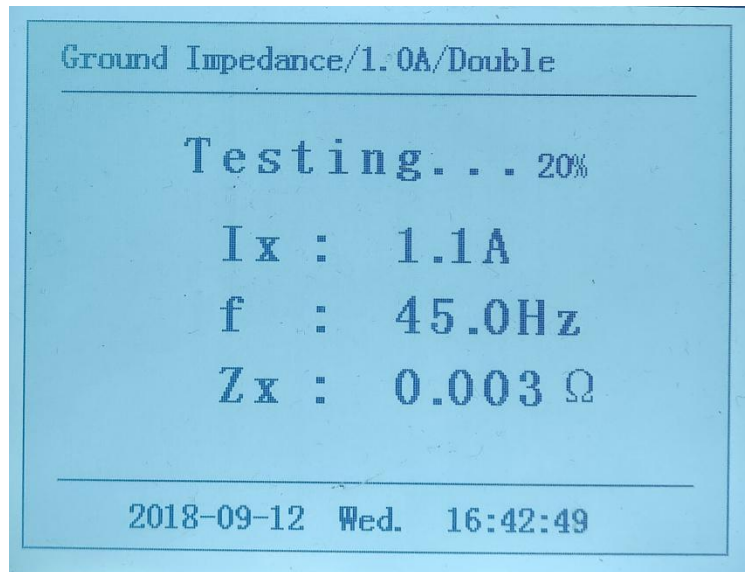


Figure 3 test interface

In this interface, the test current, test voltage and test impedance can be displayed in real time, as well as the test progress bar and percentage. During the test, long press the confirmation key to cancel the test.

After the test, the instrument directly displays the test results, and the interface is shown in figure 4.

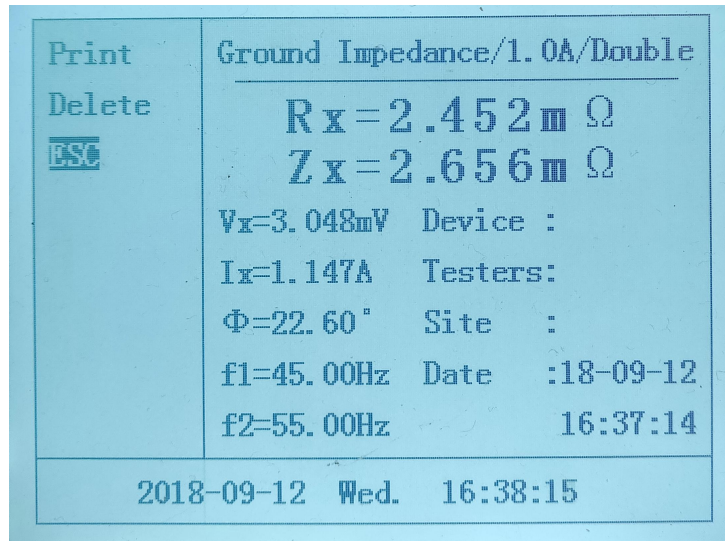


Figure 4 test results interface

"Print" : print test data.

"Delete" : save test data.

"ESC" : back to the previous menu.

The display data is as follows (the instrument is selected automatically):

R_x - [1 k grounding resistance Ω = 1000 Ω 1 Ω = 1000 m Ω]

Z_x - grounding impedance values Ω [1 k = 1000 Ω 1 Ω = 1000 m Ω]

V_x-- voltage of voltage pile [1kV=1000V 1V=1000mV]

I_x-- current pile current [1A=1000mA 1mA=1000 carbon A]

F1 -- test frequency 1

F2 -- test frequency 2

3.History menu

In the main menu interface, press ok to enter the "**historical record**" when the cursor is at "**historical record**", as shown in figure 5.

>>>>	100/005	
Clear	Number	Test date
USB	001	2018-09-12 16:37:14
ESC	002	2018-09-12 16:37:14
	003	2018-09-12 16:37:14
	004	2018-09-12 16:37:14
	005	2018-09-12 16:37:14
2018-09-12 Wed. 16:38:50		

Figure 5 historical records

"Clear" : delete all historical data stored in the instrument.

"USB" : save all historical data to usb flash disk.

"ESC" : return to the previous menu.

The single history data display interface is shown in figure 6

Print	Ground Impedance/1.0A/Double	
Delete	$R_x = 2.452\text{m}\Omega$	
ESC	$Z_x = 2.656\text{m}\Omega$	
	$V_x = 3.048\text{mV}$	Device :
	$I_x = 1.147\text{A}$	Testers:
	$\Phi = 22.60^\circ$	Site :
	$f1 = 45.00\text{Hz}$	Date :18-09-12
	$f2 = 55.00\text{Hz}$	16:37:14
2018-09-12 Wed. 16:38:15		

Figure 6 shows a single history

"Print" : print current history data.

"Delete": deletes current history data.

"ESC" : return to the previous menu.

4. "system Settings" menu

In the main menu interface, press the "system Settings" button to enter the "system Settings"

menu when the cursor is at "system Settings", as shown in figure 7.

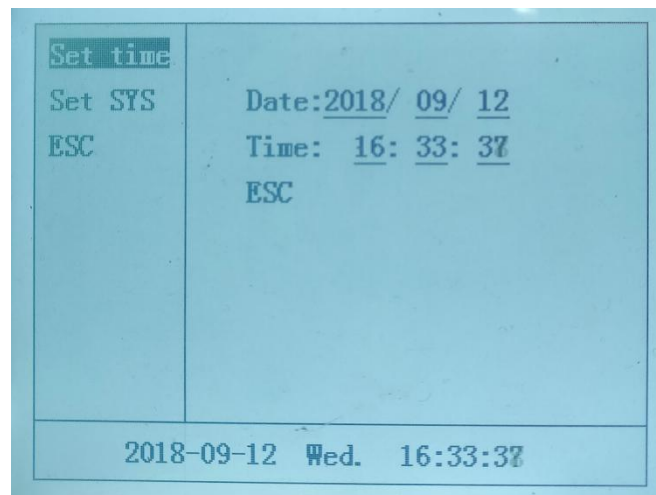


Figure 7 system Settings

"Set time" : modify the current time.

"Set SYS" : the related parameters of the instrument are set in the factory.

"ESC" : return to the previous menu.

5. "Help" menu

In the main menu interface, press the "help" button to enter the "help" menu when the cursor is at help, as shown in figure 8.

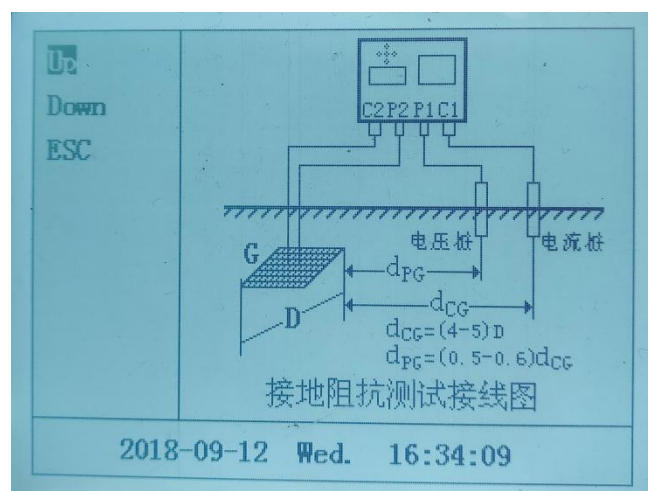


Figure 8 Help menu interface

"Up" : last picture.

"Down" : the next picture.

"ESC" : return to the previous menu.

The help menu includes four wiring diagrams used for testing, ground impedance, contact step voltage, contact voltage, and soil resistivity.

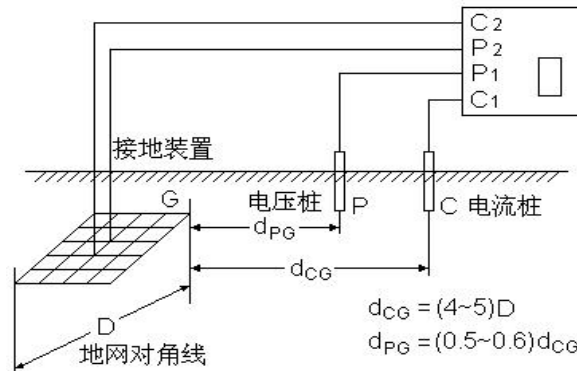
VII.Measuring connection

1. Ground impedance measurement

1) the straight-line method

The current pile and voltage pile are in line with the grounding device to be measured. Generally, the distance of d_{CG} between current pile C and the edge of the grounding device should be 4~5 times of the diagonal length of the grid. The distance between the voltage pile P and the edge of the grounding device is usually 0.5-0.6 d_{CG} . When laying, keep the current line and voltage line as far as possible to reduce the effect of electromagnetic coupling on the test results.

The current pile resistance should be minimized. If necessary, water to reduce the resistance. Instrument "current" or "pile" voltage measurement, current pile resistance should be less than 80 Ω , voltage Ω pile should be less than 200.



2) the Angle method

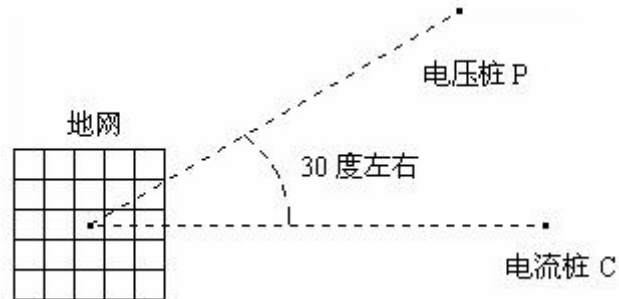
In general, the measurement of grounding impedance of large grounding device adopts the method of Angle arrangement between current and voltage lines. Generally, the distance of d_{CG} between current pile C and the edge of the grounding device should be 4~5 times of the diagonal length of the grid. d_{PG} is about the same length as d_{CG} . The earthing impedance formula can be modified by the following formula.

$$Z = \frac{Z'}{1 - \frac{D}{2} \left[\frac{1}{d_{PG}} + \frac{1}{d_{CG}} - \frac{1}{\sqrt{d_{PG}^2 + d_{CG}^2 - 2d_{PG}d_{CG} \cos \theta}} \right]}$$

θ —The Angle between the current line and the voltage line;

Z' —Test value of ground impedance.

If the soil resistivity evenly, can use dPG and dCG equal isosceles triangle wiring, the theta is about 30°, dPG = dCG = 2D grounding impedance correction calculation formula is still on.

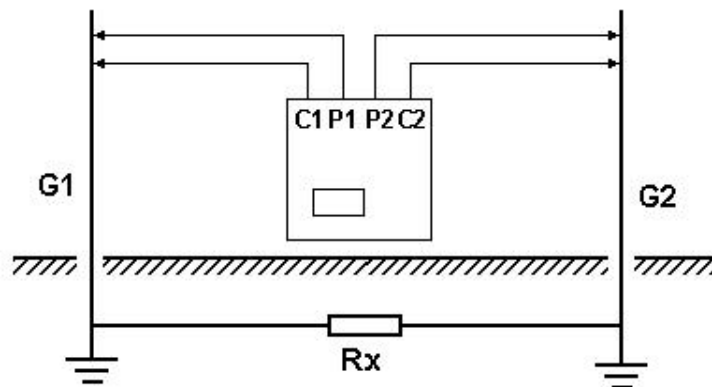


2. Earth conduction measurement

C1/P1 is connected to one earthing device and C2/P2 to another earthing device.

Matters needing attention:

- 1) do not coil the lead.
- 2) keep the voltage line away from the current line.
- 3) the earth line to be measured should be pressed on both sides of the ground clamp to prevent bad contact caused by paint rust.

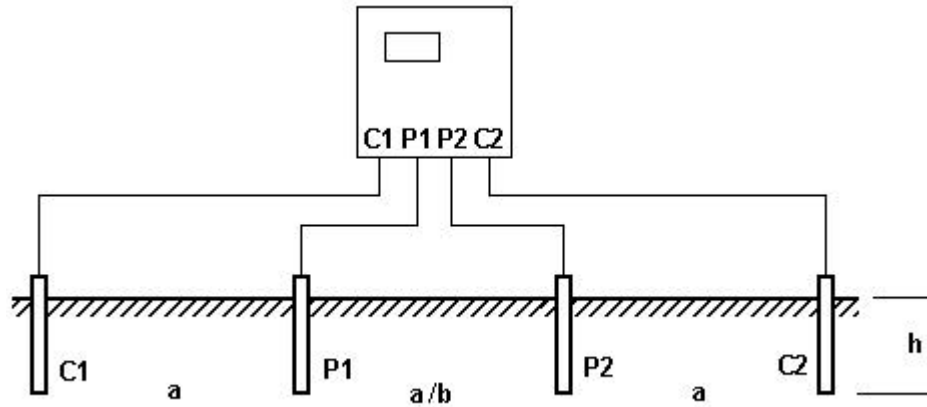


3. Soil resistivity measurement

- 1) four-pole equidistant method (Wenner method)

Four ground piles are arranged on a straight line, and the distances between ground piles are

all a. The depth of the ground pile into the ground h is not more than one twentieth of a. A could take 5,10,20,30,40 and so on. When the area of the site under test is larger, the space should be larger. The resistivity can be obtained by ground resistance R: $\rho = 2\pi aR$



2) quadrupole non-equidistant method (schlumberg-palmer method)

When the electrode distance is large, the voltage of P1 and P2 is very low. At this point, the voltage pile distance b can be increased. When the pile depth can be ignored, the resistivity is calculated as follows: $\rho = 2\pi aR (a+b) / b$

VIII. Common faults and troubleshooting

numbe r	The fault phenomenon	Cause analysis	Elimination method
1	Unable to boot	1.The fuse is broken 2.Add 380V by mistake	1.Replace the fuse of the same type 2.Check the input power
2	Light screen no display	1.Contrast adjustment	1.Adjust the contrast potentiometer
3	There is no output	1.Test products, connection open	1.Check the sample and connection for poor contact
4	Can't print	1.No printing paper 2.Thermal printer paper in reverse	1.Reposition the printing paper 2. Turn the direction of the paper roll

5	Power panel communication failed	1.Communication disorders 2.The internal communication line of the instrument falls off	1. Restart 1 minute after shutdown 2. Seek technical personnel of the manufacturer for handling
6	Power error	1.Power protection	1. Restart 1 minute after shutdown 2. Seek technical personnel of the manufacturer for handling
7	Sample mining communication failed	1.Communication disorder 2.The internal communication line of the instrument falls off	1. Restart 1 minute after shutdown 2. Seek technical personnel of the manufacturer for handling

IX. Instrument completeness

- | | |
|---------------------------|---|
| 1. Host | 1 |
| 2. Ground pile | 2 |
| 3. The power cord | 1 |
| 4. 15A fuse | 2 |
| 5.Printing paper | 2 |
| 6.The instructions | 1 |
| 7.Certificate of approval | 1 |

X. After-sale service

This product is sold within 3 years, if the quality problem will be free warranty, lifelong maintenance.

The company is no longer responsible for the maintenance!